

Technology Opportunity

Technology Transfer & Partnership Office

TOP3-00226

10- by 10-Foot Supersonic Wind Tunnel

Facility

The 10- by 10-Foot Supersonic Wind Tunnel (SWT) facility is the largest and fastest wind tunnel at NASA Glenn specifically designed to test supersonic propulsion components such as inlets and nozzles, propulsion system integration, and full-scale jet and rocket engines.

Facility Description

The 10- by 10-Foot SWT is a dual-cycle wind tunnel that operates as a closed-loop (aerodynamic cycle) or open-loop system (propulsion cycle) at test section speeds of Mach 2.0 to 3.5 and subsonically from 0 to Mach 0.36.

This facility is equipped to accommodate large-scale aerodynamic (force and moment) models and full-scale engine and aircraft components.

Facility Benefits

- Calibrated and documented test section conditions
- Real-time data acquisition and display in both alphanumeric and graphical format
- Standardized data acquisition at all Glenn wind tunnel facilities
- Integrated data acquisition and model actuation system provides for efficient, cost-effective testing
- Aerodynamic and propulsion cycle operating modes
- Model support systems (hydraulics, exhaust, high-pressure air, fuels, etc.)
- Flow visualization systems—Schlieren, oil flow, and pressure-sensitive paint
- Experienced staff of technicians, engineers, researchers, and operators
- Accommodates government and private industry research programs

- When coupled with NASA Glenn's 8- by 6-Foot Supersonic Wind Tunnel, this facility provides aerodynamic and propulsion test capabilities from low-subsonic through high-supersonic Mach range

Commercial Applications

- Next-generation launch vehicles
- Aircraft and missile development
- Inlet performance and operability
- Propulsion system integration
- Jet and rocket engines



NASA Glenn/NASA Langley loads comparison test.

Programs and Projects Supported

- High-Speed Civil Transport
- National AeroSpace Plane (NASP)
- Space Shuttle
- Joint Strike Fighter (JSF)



Rocket-based, combined-cycle (RBCC) test.

Facility Testing Information

<http://facilities.grc.nasa.gov>

Contacts

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Capabilities

10×10 Supersonic Propulsion	Aero Cycle	Propulsion Cycle
Test section speed, Mach	0.0 to 0.36 2.0 to 3.5	
Simulated altitude, ft	50,000 to 154,000	57,000 to 77,000
Test section Reynolds No./ft	0.12×10^6 – 3.4×10^6	2.2×10^6 – 2.7×10^6
Dynamic pressure, lbf/ft ²	20 to 720	500 to 600
Test section total temperature, °R	540 to 750	520 to 1,140
Auxiliary air supply		
At 40 psig	-----	-----
At 150 psig	2 lb/s	2 lb/s
At 450 psig	12 lb/s	12 lb/s
Model exhaust	Variable	20 lb/s at 2 psia
High-pressure air (2,600 psig) storage, scf	981,000	
Fuels	Liquid jet fuel Gaseous H ₂ and O ₂	